

REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections contained in the Office Action of December 15, 2004 is respectfully requested.

The Examiner rejected independent claim 1 and dependent claims 4, 5 and 6 as being anticipated by the Dubin reference (USP 5,972,192); and rejected dependent claims 2 and 3 as being unpatentable over the Dubin reference. However, independent claim 1 has now been amended as indicated above. For the reasons discussed below, it is respectfully submitted that amended independent claim 1 is now clearly patentable over the prior art of record.

As indicated above, independent claim 1 has been amended to recite that, after the etching of the plated metal film, the substrate is brought into contact with a processing liquid that offers surface activity of a surface of the substrate. As explained on page 4, line 22 through page 5, line 3 of the specification, bringing a substrate into contact with a processing liquid that offers surface activity of the substrate surface prevents abnormal separating-out of a plating metal material. As a result, the plated film will be more uniform in thickness, and can therefore be easily planarized after the plating process is completed. Thus, the surface of the substrate can be finished using a relatively simple facility and process so as to reduce space requirements and costs (see page 3, lines 2 through 6).

The Dubin reference discloses a method of pulse electroplating copper or copper alloys including a first electroplating phase, a second electro-etching phase, and a third electroplating phase (see column 7, lines 1 through 18). However, the Dubin reference does not disclose or suggest bringing a substrate into contact with a processing liquid offering surface activity of a surface of the substrate after an etching phase, as now recited in amended independent claim 1. In addition, the remaining prior art of record also does not disclose or suggest this feature. Therefore, it is respectfully submitted that amended independent claim 1 and the claims that depend therefrom are clearly patentable over the prior art of record.

In addition to the above prior art rejections, the Examiner rejected independent claim 7 and dependent claims 8 and 9 as being unpatentable over the Reid reference (U.S.P. 6,716,334) in view of the Landau reference (U.S.P. 6,261,433). However, the Examiner's rejections are traversed. For the reasons discussed below, it is respectfully submitted that independent claim 7 is clearly patentable over the prior art of record.

Although independent claim 7 has been slightly amended so as to be placed in a preferred form, it is submitted that these amendments do not affect the distinctions between the present invention as recited in claim 7 and the prior art. In particular, claim 7 is directed to a method of plating a substrate, comprising bringing a substrate into contact with a processing liquid offering surface activity of a substrate surface and/or increasing wettability between a plating solution and a surface of the substrate. In addition, the method recites performing at least one of removing the processing liquid from the substrate and drying the substrate, and bringing the substrate into contact with the plating solution to plate the substrate *after performing the at least one of removing the processing liquid from the substrate and drying the substrate*.

As explained on page 4, line 22 through page 5, line 12 of the specification, the processing liquid can prevent abnormal separating-out of copper while the substrate is being plated to produce a uniform film thickness. In addition, because the substrate is brought into contact with the plating solution *after* performing the at least one of removing the processing liquid from the substrate and drying the substrate, contamination of the plating solution by the processing liquid is prevented.

The Reid reference discloses an electroplating process, and explains that a wafer can be processed serially through three separate stages, including a pre-treatment stage, a plating stage, and a rinsing stage (see, generally, column 1, lines 12 through 37). In particular, the Reid reference discloses that *after plating is completed*, a small amount of rinsing using ultra pure water can be performed in the plating cell, and that the run-off of the water (i.e., the removal of the water) within the plating cell can cause the plating solution bath to become diluted. In other words, the plating of the substrate is performed *before* the rinsing and removal of the pure water. In contrast, independent claim 7 recites that the substrate is brought into contact with the plating solution to plate the substrate *after* performing at least one of removing a processing liquid from the substrate and drying the substrate, and the Reid reference clearly does not disclose or even suggest this feature.

Nonetheless, the Examiner asserted that the Landau reference teaches that prior to plating, ultra pure water can be introduced onto a substrate surface to ensure complete wetting. In this regard, column 18, lines 35 through 39 of the Landau reference teaches that ultra pure water is introduced onto the substrate surface to ensure complete wetting of the substrate, and

that steam can also be used to pre-wet the substrate plating surface. However, the Landau reference does not disclose or suggest bringing a substrate into contact with a plating solution to plate the substrate *after* performing one of removing a processing liquid from the substrate and drying the substrate. In contrast, the Landau reference teaches bringing the substrate into contact with a plating solution after *wetting* the substrate. Thus, the Landau reference not only does not teach or even suggest bringing a substrate into contact with a plating solution to plate the substrate after performing at least one of removing a processing liquid from the substrate and drying the substrate, the Landau reference actually *teaches away* from the present invention as recited in claim 7.

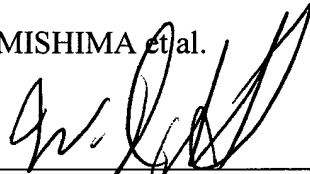
As explained above, the Reid reference and the Landau reference do not, either alone or in combination, disclose or suggest bringing a substrate into contact with a plating solution to plate a substrate *after performing at least one of removing a processing liquid from the substrate and drying the substrate*. Moreover, the Landau reference teaches wetting the substrate immediately before plating and, thus, actually teaches away from the present invention as recited in claim 7. Furthermore, the other prior art references of record also do not teach or suggest the elements recited in independent claim 7. Therefore, one of ordinary skill in the art would not be motivated to modify or combine the references so as to obtain the invention recited in amended independent claim 7. Accordingly, it is respectfully submitted that amended independent claim 7 and the claims that depend therefrom are clearly patentable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance. However, if the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact the Applicants' undersigned representative.

Respectfully submitted,

Koji MISHIMA et al.

By:



W. Douglas Hahm
Registration No. 44,142
Attorney for Applicants

WDH/abm
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
April 15, 2005